

(19) World Intellectual Property Organization
International Bureau



(43) International Publication Date
10 May 2001 (10.05.2001)

PCT

(10) International Publication Number
WO 01/33804 A2

(51) International Patent Classification: H04L 29/06

(21) International Application Number: PCT/IB00/01606

(22) International Filing Date:
3 November 2000 (03.11.2000)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
09/435,602 5 November 1999 (05.11.1999) US

(71) Applicant: NOKIA CORPORATION [FI/FT]; Keilalahdentie 4, FIN-02150 Espoo (FI).

(71) Applicant (for LC only): NOKIA INC. [US/US]; 6000 Connection Drive, Irving, TX 75039 (US).

(72) Inventor: LEPPINEN, Mika; Apartment 203, 10 Westgate Drive, Woburn, MA 01801 (US).

(74) Agent: STUART, Michael, C.; Cohen, Pontani, Lieberman & Pavane, Suite 1210, 551 Fifth Avenue, New York, NY 10176 (US).

(81) Designated States (*national*): AE, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CR, CU, CZ, DE, DK, DM, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, TZ, UA, UG, UZ, VN, YU, ZA, ZW.

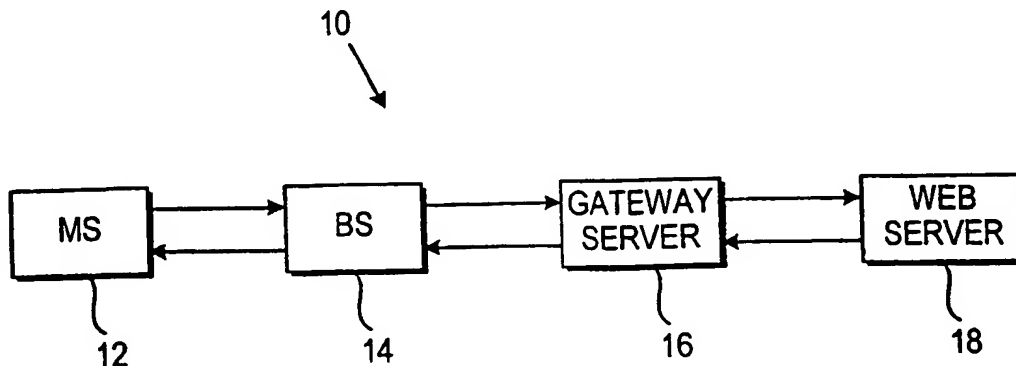
(84) Designated States (*regional*): ARIPO patent (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE, TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG).

Published:

— Without international search report and to be republished upon receipt of that report.

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

(54) Title: SYSTEM AND METHOD FOR EFFECTIVE USE OF AIR LINK BETWEEN MOBILE STATIONS AND GATEWAY SERVERS



(57) Abstract: A method and system for minimizing data transmission between a mobile station and a gateway server. The method provides that a mobile station transmits to a gateway server a request for a content and/or a resource located on a web server using a first protocol. The gateway server then transmits the request to the web server using a second protocol that is compatible with that used by the web server. The gateway server receives a redirection message from the web server indicating a new location of the content and/or resource. In response to the redirection message, the gateway server creates and transmits another request for the content and/or resource at the new location. After receiving the requested content and/or resource from the web server or another web server, the gateway server transmits the requested content and/or resource to the mobile station using the first protocol.

WO 01/33804 A2

**SYSTEM AND METHOD FOR EFFECTIVE USE OF AIR LINK BETWEEN
MOBILE STATIONS AND GATEWAY SERVERS**

BACKGROUND OF THE INVENTION

5 **1. Field of the Invention**

 The present invention relates to wireless communication systems and more particularly, to a system and method of processing mobile station requests for contents stored on a web server in a wireless
10 communication network.

2. Description of the Related Art

 Remote communication with individuals has become increasingly important in a mobile society.
15 Early versions of wireless devices transmitted a signal to a paging device worn by the user. The paging device did little more than provide a beep indicating that a message had been sent to the user. The user must then call a telephone number to receive the actual message.
20 These early paging devices were replaced with text messaging devices that include a small display that permits the transmission of a text message, such as the message sender's telephone number. While the text messaging device provided additional data to the user,
25 the user still had to use a separate telephone to contact the message sender, or to take action in accordance with the message.

 With the advent of wireless communications networks, a user can simply call any telephone number on
30 his cellular phone from virtually anywhere and once connected, speak directly to another party. Some cellular "phones" are even capable of transmitting and receiving data through an air link. These "phones," more properly named as mobile stations, operate as

mobile terminals have features similar to those of desktop computer terminals, features such as, for example, the ability to access stock quotes, weather, and e-mail messages through the Internet. Typical
5 mobile stations, however, have less powerful processors and memories than those of desktop terminals because they have severe size and power consumption constraints. The amount of data and the reliability of data transmission are also limited by the available spectrum,
10 i.e., the radio resources allotted to the mobile station.

Prior art systems require the terminals including mobile stations to perform a variety of tasks while communicating with a web (or origin) server, much
15 like the desktop terminals. Such tasks include processing of redirection messages from web servers, i.e., messages redirecting the "user agents" (e.g., web browsers) of the mobile stations to new locations to which the requested resources or contents have been
20 moved. The location of a content or a resource on the Internet is identified by what is known as Uniform Resource Locator (URL), a global address of documents and resources on the World Wide Web. A URL has two parts, the first part specifying the protocol or scheme
25 (e.g. HyperText Transfer Protocol (HTTP) or File Transfer Protocol (FTP)) used for fetching the content and the second part specifies the address or location of the content. Thus, for example, when a mobile station accesses a content that has been moved, the web server
30 sends an HTTP redirection message to a gateway server indicating the new location of the requested content. The gateway server then sends a message encoded according to the Wireless Application Protocol to the mobile station through the wireless portion of the

network. Once the mobile station receives the redirection message, its web browser automatically sends a new WAP encoded request to the gateway server which decodes the request and generates a new URL request
5 identifying the new location.

These tasks, however, waste valuable radio resources in the wireless network. There is accordingly a need for a system and method that minimizes usage of radio resources while a mobile station is communicating
10 with a web server.

SUMMARY OF THE INVENTION

An object of the invention is to provide a method and a system for optimizing data transmission to
15 a mobile station when the mobile station communicates with a web or origin server.

According to an aspect of the invention, tasks associated with redirection messages from a web server are handled by a gateway server so as to minimize usage
20 of radio resources in a wireless communication network. The processing of redirection messages by the gateway server is transparent to the mobile station so that the mobile station receives the requested content or resource without sending another request to a web
25 server, even though the requested content or resource has been moved to a different location (at the same web server or another web server). When the requested content or resource has been successfully downloaded, the mobile station stores the new location in its
30 history file.

In one embodiment of the invention, a mobile station transmits to a gateway server a request for a content and/or a resource located on a web server using a first protocol. The gateway server then transmits the

request to the web server using a second protocol that is compatible with that used by the web server. The gateway server receives a redirection message from the web server indicating a new location of the requested content and/or resource. In response to the redirection message, the gateway server creates and transmits another request for the content and/or resource at the new location. After receiving the requested content and/or resource from the same web server or another web server, the gateway server transmits the requested content and/or resource to the mobile station using the first protocol.

Other objects and features of the present invention will become apparent from the following detailed description considered in conjunction with the accompanying drawings. It is to be understood, however, that the drawings are designed solely for purposes of illustration and not as a definition of the limits of the invention, for which reference should be made to the appended claims. It should be further understood that the drawings are not necessarily drawn to scale and that, unless otherwise indicated, they are merely intended to conceptually illustrate the structures and procedures described herein.

25

BRIEF DESCRIPTION OF THE DRAWINGS

In the drawings:

Fig. 1 is a block diagram illustrating a system configured to operate in accordance with an embodiment of the invention; and

Figs. 2A and 2B are a flowchart describing the inventive steps performed by the embodiment of Fig. 1.

DETAILED DESCRIPTION OF THE PRESENTLY PREFERRED EMBODIMENTS

Fig. 1 illustrates a system 10 configured in accordance with one embodiment of the invention. The system includes a mobile station (MS) 12, a base station (BS) 14, a gateway server 16, and an origin or web server 18. The MS 12 (e.g., a cellular phone with a video display such as a liquid crystal display, a handheld or laptop computer with communication capabilities, etc.) preferably includes a Wireless Application Protocol (WAP) user agent configured for communicating with the web server 18 through the gateway server 16. The user agent may, for example, be a micro web browser having features that are similar to a conventional web browser employed by a desktop computer terminal but requires far less computer memory and/or processing power. The BS 14 includes a base transceiver station (not shown) for relaying messages through an air-link between the MS 12 and the gateway server 16. The system 10 may also include a mobile switching center (not shown) for routing and monitoring messages between the BS 14 and the gateway server 16.

The gateway server 16 decodes requests received from the MS 12 and encodes the requests based on World Wide Web communication protocols such as, for example, the HyperText Transfer Protocol (HTTP). The encoded requests are then sent to the appropriate web servers for accessing contents and/or resources stored thereat. HTTP is a commonly used protocol on the Internet; it is a stateless protocol as each command is executed independently, i.e., without any knowledge of previous HTTP commands.

The locations of the contents and/or resources at the web server 18 or another web server are uniquely identified by Uniform Resource Locators (URLs) and

accessible by the mobile station 12, if authorized. As defined herein, the term "content" includes data stored or generated by a web server and typically displayed or interpreted by a user agent (e.g., a web browser); and
5 the term "resource" includes routines (e.g. executable files), network data objects or services. Thus, a user, using an appropriate user agent, can access and retrieve contents and resources from a web server by simply specifying an appropriate URL. If, however, the user-
10 specified URL for the requested content or resource has been moved to a new location, the web server 18 sends out a redirection message concerning the new location of the requested contents or resources. The new location may be referenced relative to a location specified in
15 the original or a subsequent request, or may also be a complete URL containing a full path of the requested content or resource without referencing a location specified by a previous URL request.

Advantageously, the gateway server 18 is
20 configured to send out new URL requests, on behalf of the MS 12, in response to the redirection message from the web server 18. Once the gateway server 16 receives the desired content or resource, the information is encoded and transmitted to the MS 12 together with the
25 new location of the resource or content.

Figs. 2A and 2B are a flow diagram illustrating the steps to be performed by the preferred embodiment of the present invention. In step 100, the MS 12 sends a message, preferably coded using WAP,
30 requesting a content or resource from the web server 18 through the gateway server 16. In step 102, the gateway server 16 transforms the request into a URL request using, for example, the HTTP scheme, and sends the message out to the web server 18. In step 104, the

web server 18 responds with an HTTP redirection message indicating the new location of the requested content or resource. In step 106, the gateway server 16 makes a new HTTP URL request containing the new URL in accordance with the redirection message. The new HTTP URL request may be directed to the same web server 18 or to another web server. Steps 110 and 112 may be repeated until the gateway server 16 receives the requested content or resource as indicated in step 108.

10 In step 110, the gateway server 16 sends the requested content or resource, preferably coded using WAP, together with its new location (i.e., the new URL for the requested content) in the form of, for example, a header to the MS 12. In step 112, the MS 12 receives

15 the requested content or resource and updates its history file with the new URL.

Thus, while there have shown and described and pointed out fundamental novel features of the invention as applied to a preferred embodiment thereof, it will be understood that various omissions and substitutions and changes in the form and details of the devices illustrated, and in their operation, may be made by those skilled in the art without departing from the spirit of the invention. For example, it is expressly

20 intended that all combinations of those elements and/or method steps which perform substantially the same function in substantially the same way to achieve the same results are within the scope of the invention. Moreover, it should be recognized that structures and/or

25 elements and/or method steps shown and/or described in connection with any disclosed form or embodiment of the invention may be incorporated in any other disclosed or described or suggested form or embodiment as a general matter of design choice. It is the intention,

30

therefore, to be limited only as indicated by the scope of the claims appended hereto.

CLAIMS

What is claimed is:

1. A method for minimizing data transmission between a mobile station and a gateway server,
5 comprising the steps of:
 - (a) transmitting by a mobile station to a gateway server a request for at least one of content and resource located on a web server using a first protocol;
 - (b) transmitting the request by the gateway
10 server to the web server using a second protocol that is compatible with that used by the web server;
 - (c) receiving a redirection message by the gateway server from the web server, the redirection message indicating a new location of the at least one of
15 content and resource;
 - (d) creating and transmitting by the gateway server to one of the web server and another web server another request for the at least one of content and resource at the new location in response to the
20 redirection message;
 - (e) receiving by the gateway server the at least one of content and resource from said one of the web server and another web server; and
 - (f) transmitting the at least one of content
25 and resource from the gateway server to the mobile station using the first protocol.
2. The method of claim 1, further comprising the step (g) of transmitting the new location of the at least one of content and resource to the mobile station
30 from the gateway server.
3. The method of claim 2, wherein the new location is included as a header transmitted with the at least one of content and resource.

4. The method of claim 1, wherein the first protocol of step (a) is based on the Wireless Application Protocol.

5. The method of claim 1, wherein the second protocol of step (b) is based on a World-Wide Web protocol.

6. The method of claim 5, wherein the second protocol is the HyperText Transport Protocol.

7. The method of claim 1, wherein the request is coded as a Uniform Resource Locator.

8. A system for minimizing data transmission between a mobile station and a gateway server, comprising:

a mobile station for transmitting a request for one of content and resource at a location using a first protocol;

a gateway server, connected to said mobile station, for receiving the request from said mobile station using the first protocol and for encoding and transmitting the request using a second protocol; and

a web server connected to said gateway server for storing at least one of content and resource, said web server receiving the encoded request from said gateway server and sending a redirection message to said gateway server indicating a new location of the requested one of content or resource, said gateway server receiving the redirection message and sending a request to the new location without communicating the redirection message to said mobile station, said gateway server accessing the requested one of content and resource from one of said web server and another web server in accordance with the new location and transmitting to said mobile receiver the requested one of content and resource.

9. The system of claim 8, wherein the request from said gateway server is a Uniform Resource Locator.

5 10. The system of claim 8, wherein the first protocol is the Wireless Application Protocol and the second protocol is the HyperText Transfer Protocol.

10 11. The system of claim 8, wherein said gateway server is configured to send the new location to said mobile station together with the requested one of content and resource.

12. The system of claim 8, wherein said web server includes the requested one of content and resource at the new location.

1/3

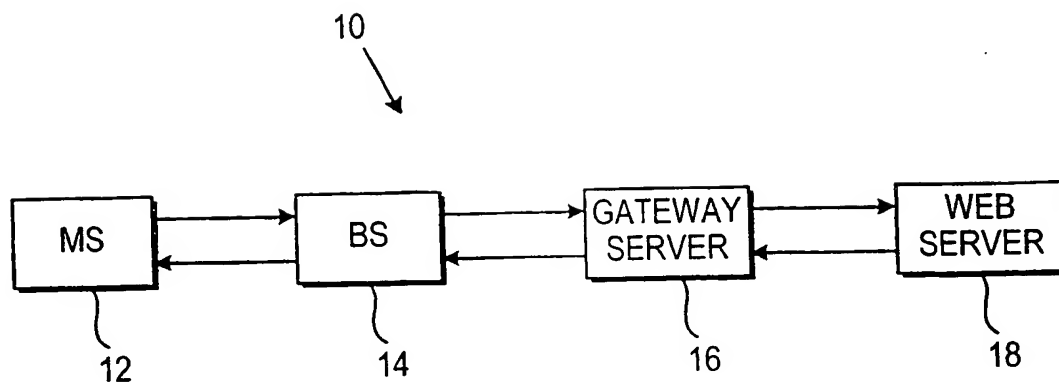


FIG. 1

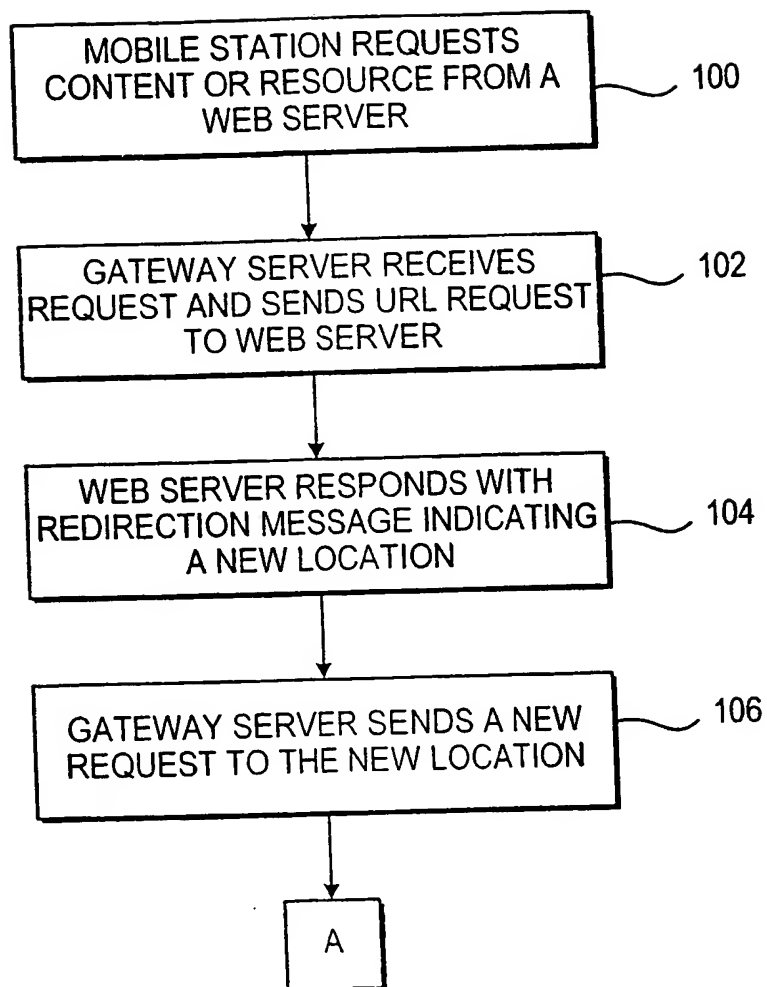


FIG. 2A

3/3

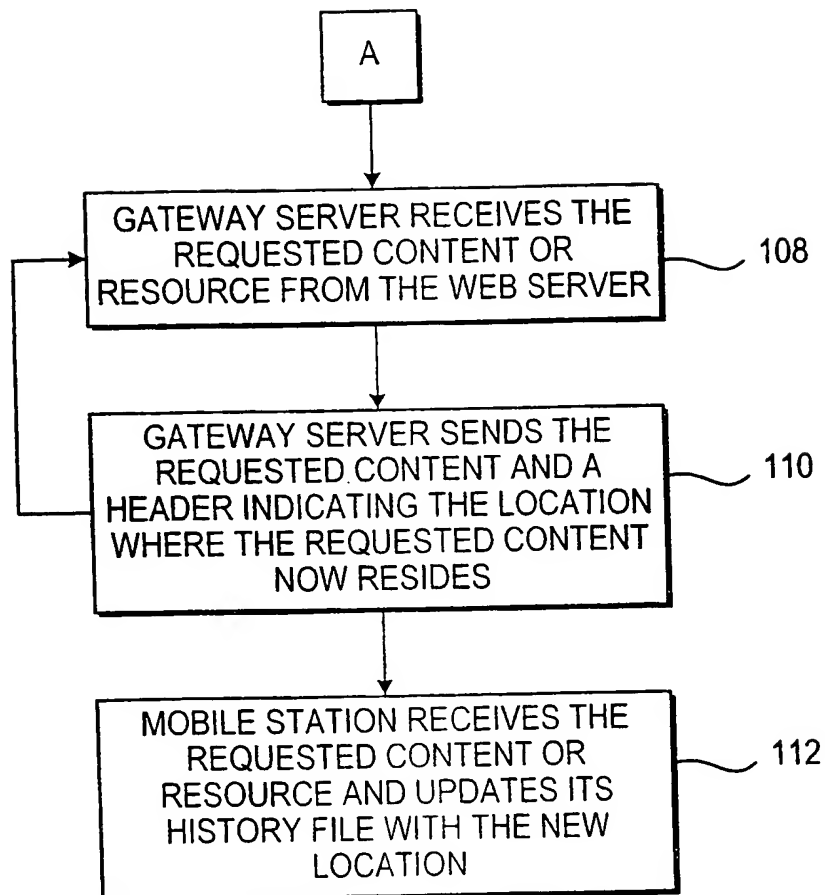


FIG. 2B

(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau



(43) International Publication Date
10 May 2001 (10.05.2001)

PCT

(10) International Publication Number
WO 01/33804 A3

(51) International Patent Classification?: **H04L 29/08**

(21) International Application Number: **PCT/IB00/01606**

(22) International Filing Date:
3 November 2000 (03.11.2000)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
09/435.602 5 November 1999 (05.11.1999) US

(71) Applicant: **NOKIA CORPORATION** [FI/FI]; Keilalahdenie 4, FIN-02150 Espoo (FI).

(71) Applicant (for LC only): **NOKIA INC.** [US/US]; 6000 Connection Drive, Irving, TX 75039 (US).

(72) Inventor: **LEPPINEN, Mika**; Apartment 203, 10 Westgate Drive, Woburn, MA 01801 (US).

(74) Agent: **STUART, Michael, C.**; Cohen, Pontani, Lieberman & Pavane, Suite 1210, 551 Fifth Avenue, New York, NY 10176 (US).

(81) Designated States (*national*): AE, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CR, CU, CZ, DE, DK, DM, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, TZ, UA, UG, UZ, VN, YU, ZA, ZW.

(84) Designated States (*regional*): ARIPO patent (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE, TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG).

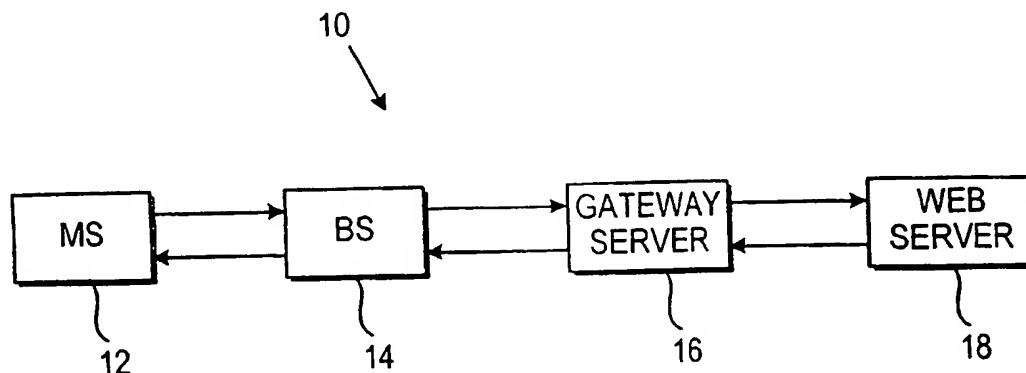
Published:

— with international search report

(88) Date of publication of the international search report:
6 December 2001

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

(54) Title: **SYSTEM AND METHOD FOR EFFECTIVE USE OF AIR LINK BETWEEN MOBILE STATIONS AND GATEWAY SERVERS**



(57) Abstract: A method and system for minimizing data transmission between a mobile station and a gateway server. The method provides that a mobile station transmits to a gateway server a request for a content and/or a resource located on a web server using a first protocol. The gateway server then transmits the request to the web server using a second protocol that is compatible with that used by the web server. The gateway server receives a redirection message from the web server indicating a new location of the content and/or resource. In response to the redirection message, the gateway server creates and transmits another request for the content and/or resource at the new location. After receiving the requested content and/or resource from the web server or another web server, the gateway server transmits the requested content and/or resource to the mobile station using the first protocol.

WO 01/33804 A3

INTERNATIONAL SEARCH REPORT

Int. l. Application No

PCT/IB 00/01606

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 H04L29/08

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 7 G06F H04L

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)
EPO-Internal, WPI Data, PAJ, INSPEC

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	EP 0 811 939 A (WEBTV NETWORKS INC) 10 December 1997 (1997-12-10) column 15, line 10 - line 59 ---	1-12
A	BERNERS-LEE T: "Hypertext Transfer Protocol- HTTP/1.1 RFC 2616" IETF NETWORK WORKING GROUP, June 1999 (1999-06), XP002159137 page 40, line 4 -page 42, line 14 ---	1-12
A	WO 99 40514 A (BALTER JAMES A ;FARBER DAVID A (US); GREER RICHARD E (US); SWART A) 12 August 1999 (1999-08-12) page 12, line 9 - line 14 page 14, line 2 - line 7 page 15, line 1 - line 4 --- -/--	1-12

☒ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

* Special categories of cited documents :

- *A* document defining the general state of the art which is not considered to be of particular relevance
- *E* earlier document but published on or after the international filing date
- *L* document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
- *O* document referring to an oral disclosure, use, exhibition or other means
- *P* document published prior to the international filing date but later than the priority date claimed

T later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

X document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

Y document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

G document member of the same patent family

Date of the actual completion of the international search

6 June 2001

Date of mailing of the international search report

15/06/2001

Name and mailing address of the ISA

European Patent Office, P.B. 5818 Patentlaan 2
NL - 2280 HV Rijswijk
Tel. (+31-70) 340-2040, Tx. 31 651 epo nl.
Fax: (+31-70) 340-3016

Authorized officer

Tous Fajardo, J

INTERNATIONAL SEARCH REPORT

Int. l. Application No

PCT/IB 00/01606

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	<p>"WAP Architecture"</p> <p>WAP ARCHITECTURE VERSION 30 APR 1998, XX, XX,</p> <p>26 April 1999 (1999-04-26), pages 1-20, XP002101098</p> <p>page 12, line 4 -page 13, line 17</p> <p>figures 2,3</p> <p>-----</p>	1-12

INTERNATIONAL SEARCH REPORT

Information on patent family members

Int. l. Application No

PCT/IB 00/01606

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
EP 0811939 A	10-12-1997	US 5918013 A	29-06-1999
		AU 3375197 A	05-01-1998
		JP 10228437 A	25-08-1998
		WO 9746943 A	11-12-1997
		US 6023268 A	08-02-2000
		US 6230319 B	08-05-2001
		US 6141693 A	31-10-2000
		US 5940074 A	17-08-1999
		US 6073168 A	06-06-2000
		US 5935207 A	10-08-1999
		US 5996022 A	30-11-1999
		US 5974461 A	26-10-1999
WO 9940514 A	12-08-1999	US 6185598 B	06-02-2001
		AU 2652999 A	23-08-1999
		EP 1053524 A	22-11-2000
		NO 20004010 A	10-10-2000